THE TEXAS THUNDERBOLT

NATIONAL WEATHER SERVICE -- FORT WORTH, TX
SERVING ALL OF NORTH TEXAS
WWW.WEATHER.GOV/FORTWORTH

SUMMER/FALL
2008

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Background image is courtesy of Alan Moller.
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What is a Center Weather Service Unit (CWSU)?

by Doug Reno, Fort Worth CWSU

In addition to meteorologists at the Fort Worth Forecast Office, there is another group of meteorologists whose primary focus is aviation weather. These forecasters staff the Fort Worth Air Route Traffic Control Center (ARTCC) Center Weather Service Unit (CWSU). This group of four meteorologists consists of three forecasters and a Meteorologist-In-Charge. Fort Worth Center, located south of DFW International Airport, is one of 20 en-route Centers in the continental U.S. and one Center in Anchorage, AK.

The CWSU is staffed two shifts per day with operating hours from 5:30am to 9:30pm. Fort Worth Center covers 174,000 square miles of airspace, and includes portions of Texas, New Mexico, Oklahoma, Arkansas, and Louisiana. DFW is consistently ranked one of the world's busiest airports, and in 2007 was listed 3rd in the world in the number of aircraft takeoffs and landings.

Above: Fort Worth Air Route Traffic Control Center and home to the Fort Worth CWSU, near DFW Airport. NWS image.

The CWSU meteorologist's primary responsibility is providing up-to-the-minute weather information and briefings to the ARTCC Traffic Management Unit and control room supervisors. Especially important is the meteorologist's input regarding thunderstorm impacts on arrival and departure routes into and out of DFW.

CWSU meteorologists provide two formal briefings per day; one for the morning/early afternoon shift and one for the afternoon/evening shift. Briefings consist of information on winds aloft, turbulence and icing conditions, surface conditions, and precipitation.

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What is a CWSU?
Continued

CWSU forecasters also issue Center Weather Advisories, which are aviation weather warnings for thunderstorms, icing, turbulence, and areas of low clouds and visibilities. Furthermore, the forecasters collaborate closely with meteorologists at the National Weather Service's Aviation Weather Center in Kansas City, MO to prepare national aviation forecasts.

Pilot reports received from aircraft in contact with ARTCC air traffic controllers provide valuable real-time information about cloud heights, turbulence, icing, and low level wind shear conditions. CWSU meteorologists transmit these pilot reports so that other pilots, airline dispatchers, and flight briefers have this key information.

In addition, CWSU meteorologists coordinate airport weather forecasts with the Fort Worth Forecast Office. So, the next time you take to the skies, rest assured the weather throughout your journey is being closely monitored.

Above: Fort Worth CWSU operations area. NWS image.

Want to Know More?

Visit the Fort Worth CWSU website at http://www.srh.noaa.gov/zfw

Ch-Ch-Ch-Changes Coming to a TAF near You!

by Dan Shoemaker

With new longer range airplanes flying farther than ever, aviation customers need Terminal Aerodrome Forecasts (TAFs) with a longer duration than the current 24 hours. 0000 UTC November 5, 2008 (6pm CST November 4), is the time the International Civil Aviation Organization has designated for a world-wide switchover to a new format that will accomodate 30 hour TAFs. The National Weather Service will start producing 30 hour TAFs for 32 airports (those where long range international flights land or those airports used as alternates for long range flights) across the country, including DFW International in North Texas.

Because customers need to differentiate between the first six hours and the last six hours of a 30 hour TAF, the format for ALL TAFs will change to comply with international standards. The day will be indentified in all time groups. This change will affect all 24 hour TAFs (KACT, KAFW, KDAL, KFTW in North Texas), as well as the new 30 hour TAF for KDFW.

See Page 3 for a comparison between the current TAF format and the new format effective 0000 UTC November 5.

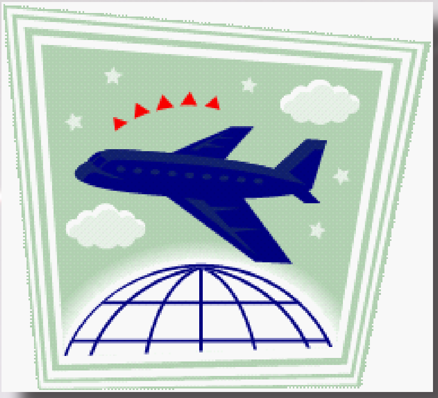
Find more details on the TAF format change at http://aviationweather.gov/notice/taf30.php

Ch-Ch-Ch-Changes Coming to a TAF near You!
Continued

To see how these changes will look, let's take a typical summertime KDFW TAF:

Current Format:

```
TAF KDFW 241730Z 241818 15007KT P6SM SCT050
FM2000 18010G20KT P6SM SCT050CB
       TEMPO 2201 4SM TSRA BKN040CB
FM0100 15008KT P6SM SCT250=
```



New Format (0000 UTC Nov 5):

```
TAF KDFW 241730Z 2418/2524 15007KT P6SM SCT050
FM242000 18010G20KT P6SM SCT050CB
       TEMPO 2422/2501 4SM TSRA BKN040CB
FM250100 15008KT P6SM SCT250
FM252200 18015G25KT P6SM VCTS SCT050CB=
```

Currently, Date/Time groups (DTG), FROM (FM) groups, and TEMPO groups are time coded in a 4 digit hour-minute code. This will change to a 6 digit FM group, and an 8 digit DTG and TEMPO group with two 4 digit DTGs separated by a slash. For example, the current 18 UTC TAF has a DTG of 241818. In the new format, it reads 2418/2524 to show the 30 hour valid period. A 24 hour TAF would read 2418/2518.

For FM groups, the current FM2000 doesn't answer the question "Is this 20Z today or 20Z tomorrow?" To make the day clear, the new FM group reads FM242000 for the period 2 hours from issuance. It would read FM252000 for the period 26 hours out.

For a TEMPO group, the new format is TEMPO 2422/2501. This would mean the condition could occur between 22Z on the 24th to 01Z on the 25th. Notice also that there may be changes past 24 hours that will now be indicated in the TAF.

What a Difference a Year Makes!

by Nick Hampshire

In comparison, the summer of 2007 and this summer were complete opposites. Last summer was cool with abundant rainfall, and this summer was hot and dry with drought conditions once again plaguing North Texas.

The summer of 2007 witnessed record rainfall across the area. Upper-level low pressure systems situated over Texas brought plentiful rainfall to North Texas during the months of May, June, and July. Many rivers across the area were over their banks, and with saturated soils there were many flash floods. The rainfall and cloud cover kept the 2007 North Texas summer rather cool. Temperatures last summer were 1 to 4 degrees below normal over much of the region. There were only five 100 degree days in the summer of 2007 at DFW, with the average summer recording 16 days.

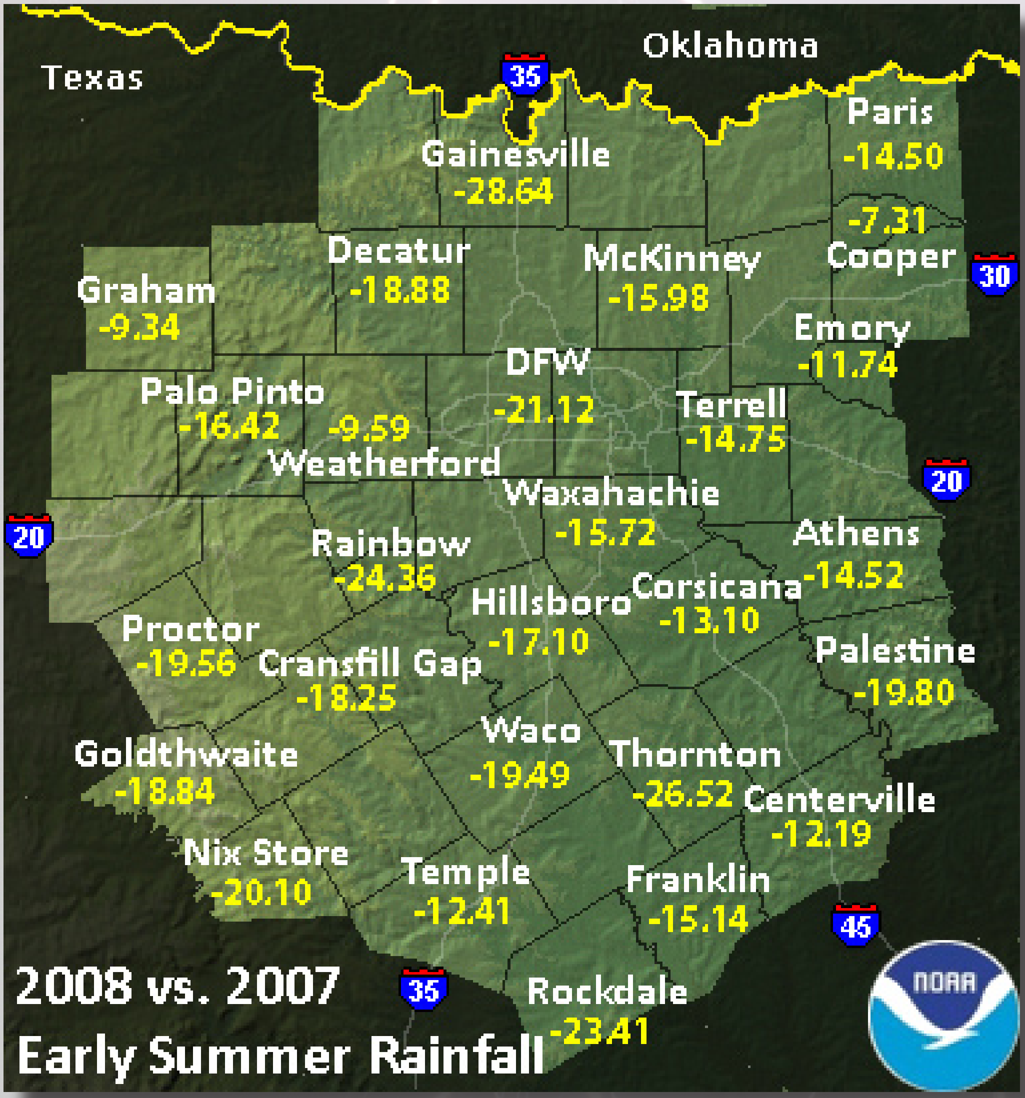
More on Page 4

What a Difference a Year Makes!

Continued

This summer, the weather across North Texas was dominated by several upper-level high pressure systems, which kept high amounts of rain out of the picture. The flooding conditions last year were replaced with drought conditions for most of North Texas into early September. Rainfall across much of the area in August helped to alleviate some rainfall deficits, however much of North Texas remained in drought. Upper-level highs also contributed to temperatures above climatology. Temperatures this summer were 1 to 5 degrees above climatological normals. The average number of 100 degree days for DFW and Waco are 16 and 20, respectively. As of August 24th, DFW had recorded 30 days and Waco had reported 20 days at or above 100 degrees.

The difference in rainfall amounts from May, June, July of 2007 and that of 2008 were astounding in some locations. DFW International Airport received over 21 inches less rainfall in 2008. Rockdale, which was in extreme drought as of August 5, received 23.41 inches less this year than in 2007. The biggest contrast between 2007 and 2008 was in Gainesville. This was due to the flash flood event of June 18, 2007 in which 8 to 12 inches of rain fell in a few hours. Additional 2007 vs. 2008 May/June/July rainfall deficit data can be seen in the graphic below.

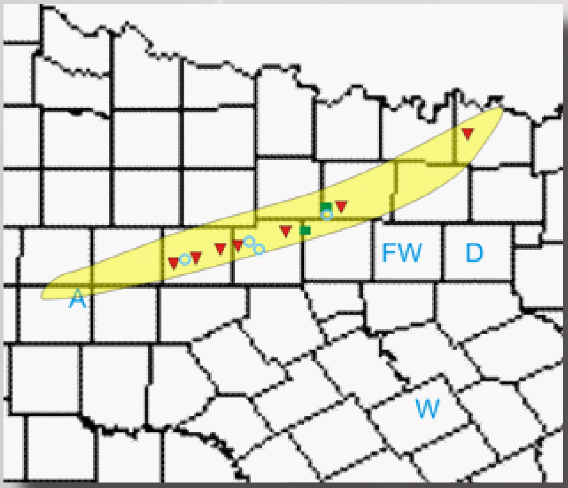


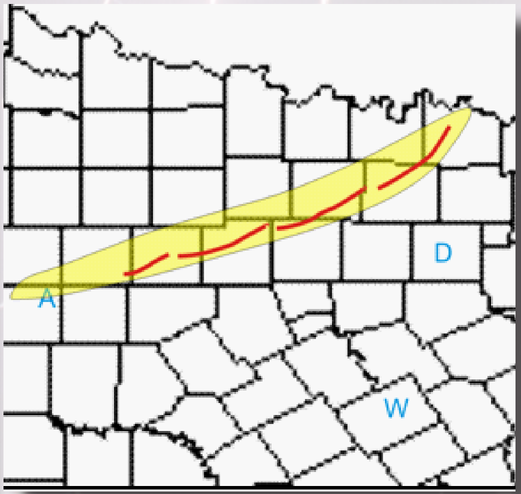
The Cyclic Supercell of April 9, 2008

by Gary Woodall

On the afternoon and evening of April 9, one of the longest-lived supercells in recent weather history moved across western and northern portions of Texas. The storm developed over Taylor County, west of Abilene, and dissipated along the Red River north of Denison. The storm lasted several hours and covered nearly 240 miles. It produced at least seven tornadoes, injured at least six people, and caused over $1 million in damage.

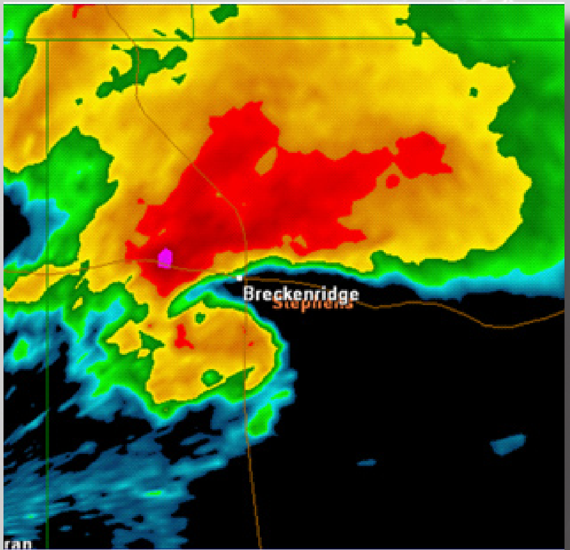
The map below shows the area impacted by the storm. Tornado, hail, and wind reports are shown. The heavy red lines show the mesocyclones associated with the storm. Mesocyclones are areas of rotation within supercell thunderstorms which enhance the possibility of tornadoes or other severe weather. The April 9 storm was considered a "cyclic supercell", since it produced multiple mesocyclones.

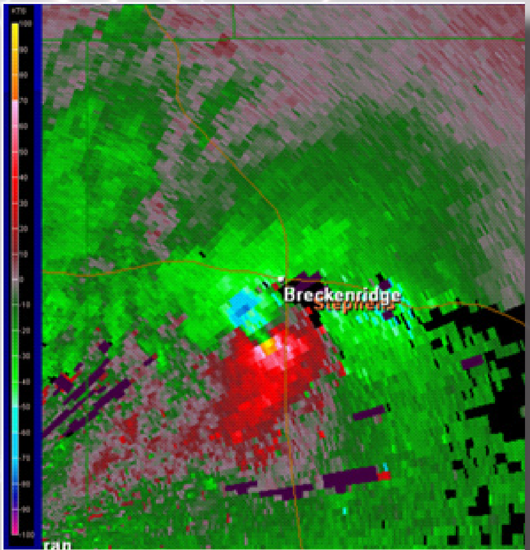




Severe weather reports (left) and mesocyclone tracks (right) of April 9, 2008 supercell. red triangles denote tornadoes, blue circles indicate hail, green squares indicate wind damage, and heavy red lines denote mesocyclones. Abilene, Fort Worth, Dallas, and Waco are noted.

The most significant tornado produced by the storm was near Breckenridge, in Stephens County. The radar images below were taken just before the tornado developed. Note the classic "hook echo" appearance in the reflectivity display, suggestive of a mesocyclone. The velocity display shows a strong cyclonic rotation signature, with velocities of over 100 mph, southwest of Breckenridge. The damage photo on page 6 was taken near the Breckenridge airport, south of town.





Reflectivity (left) and velocity (right) from Doppler radar near Moran at 5:16 pm. Note "hook echo" configuration in reflectivity and cyclonic rotation (bright blue to the left of bright red) in the velocity image.

The Cyclic Supercell of April 9, 2008
Continued

Communication networks and cooperation played an important role as the storm moved through. Communication networks in Stephens County became overwhelmed as the storm approached. Dispatchers in Breckenridge relayed storm reports when possible, and fielded dozens of assistance calls as the storm moved through. Additionally, officials in Eastland County were able to monitor the spotter traffic in Stephens County and relayed reports to and from our office in Fort Worth. As the storm progressed, spotters provided up-to-the-minute observations of storm structure, the near-storm environment, and ground-truth severe weather reports.

Above: Damage to Breckenridge Airport following the April 9, 2008 tornado. Photo by Gary Woodall.

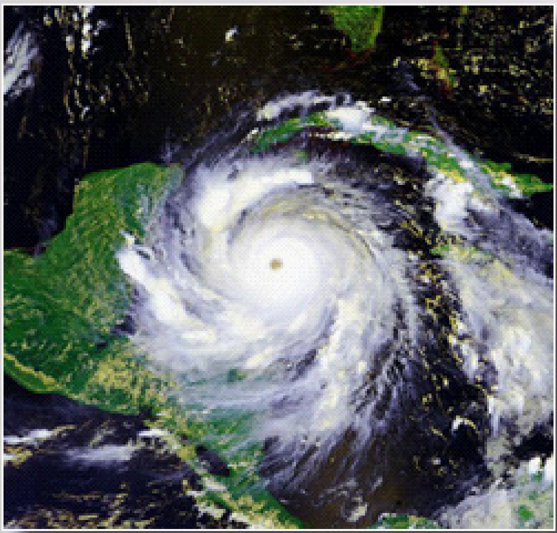
Hurricane Ike synopsis...
Coming in our Winter Issue!

DR. WEATHER'S WISDOM

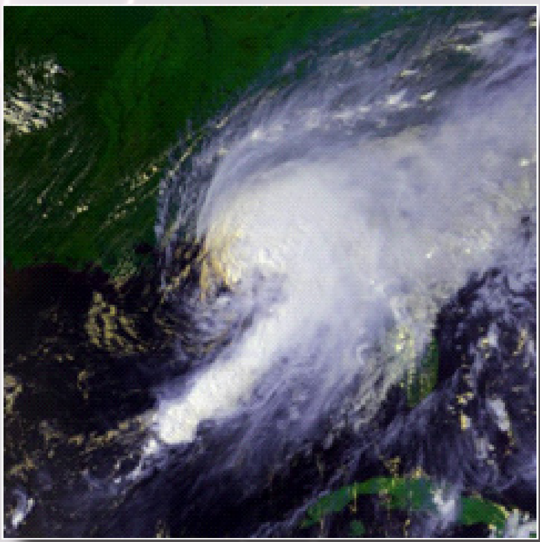
LOW PRESSURE SYSTEMS

BY: TED RYAN

Low pressure systems are formed due to atmospheric heat imbalances and serve the critical task of redistributing heat and moisture across vast regions. One scheme for classifying low pressure systems assigns the terms **baroclinic** or **barotropic**. Baroclinic low pressure systems form and intensify as a result of *horizontal* temperature differences, which are typically concentrated across a frontal boundary, such as a warm front or cold front. However, frontal boundaries are rare in the tropical latitudes and low pressure systems there often form as a result of *vertical* heat imbalances between the surface and the upper level atmosphere. These types of lows are classified as barotropic, and virtually all hurricanes fall into this category.



Above: Hurricanes, examples of intense barotropic lows, have the unmistakable satellite appearance of symmetrical spiraling bands around a clear eye center.



Above: Intense baroclinic low pressure systems (like the famed Nor'easter) are usually not symmetrical and typically have a satellite appearance resembling a comma shape.

A hurricane requires special parameters to form, but the fundamental ingredient is a heat imbalance between the surface and the atmosphere. Typically, a water temperature that is at least 80°F results in a heat imbalance strong enough to allow an ordinary barotropic low to intensify into a hurricane. But does that mean that intense barotropic lows can only form in the tropics and during months when waters are warm? Absolutely not! In fact, under rare circumstances, intense barotropic lows can form in rather odd locations and have a visual satellite appearance that closely resembles a hurricane!

For example, under the right conditions, low pressure systems in polar regions can evolve into intense barotropic lows. Such systems have been referred to as "Arctic Hurricanes" based on their oceanic origins and the satellite appearance of a small, cloud free circulation center. Unlike hurricanes, they form in high latitudes over ocean waters colder than 45°F. Even over the cool 60°F waters of the Mediterranean Sea, hurricane-like low pressure systems have developed a few times over the last century. Perhaps the most unusual example is a barotropic low that formed over Lake Huron in September 1996. The storm developed spiraling rain bands and a cloud free circulation center just off the Michigan coastline!

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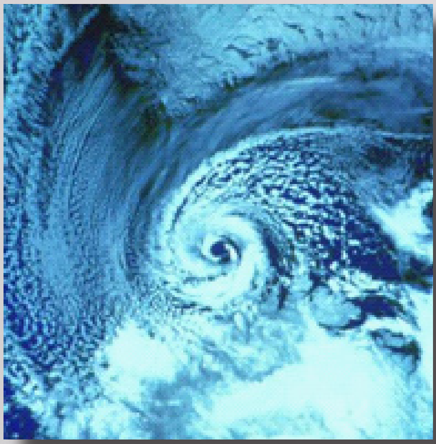
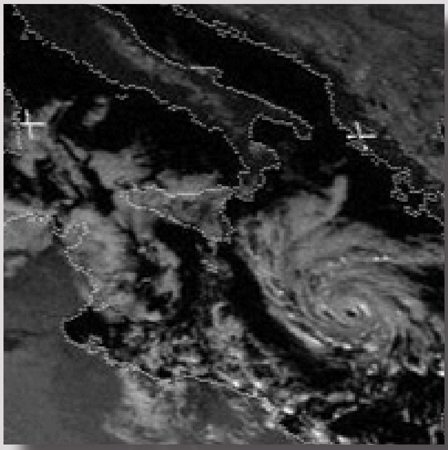
LOW PRESSURE SYSTEMS

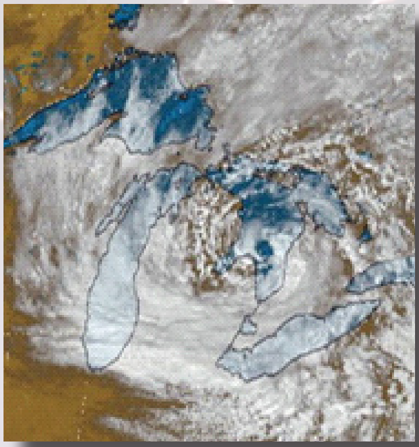
While wind speeds with many of these lows never reach the 74 mph threshold associated with hurricanes, they were all mature and intense barotropic low pressure systems with strong winds and heavy precipitation. The lows formed and intensified as a result of a heat imbalance between water that was very warm relative to cold air in the middle-upper level atmosphere. They are very closely related to their tropical counterparts, but aren't true hurricanes despite their remarkably similar appearance. Just glancing at one of the satellite images below, one might wonder, "What in the world is that hurricane doing there?"



Above: "Arctic Hurricane" off Norway coastline in Feb 1987.



Above: "Mediterranean Hurricane" southeast of Italy in Jan 1995.



Above: Informally dubbed as "Hurricane Huron", a barotropic low spins off the Michigan coast in Sept 1996.

New Doppler Radar Products Improve Warnings & Forecasts

by Eric Martello

Weather Service Doppler Radars (WSR-88Ds) utilized at the NWS have always been key monitoring tools for meteorologists. Recently, these WSR-88Ds went through upgrades in both hardware and software. The latest upgrade to our radars came in July with the arrival of Build 10.0, beginning the era of super resolution (super-res) velocity and reflectivity products.

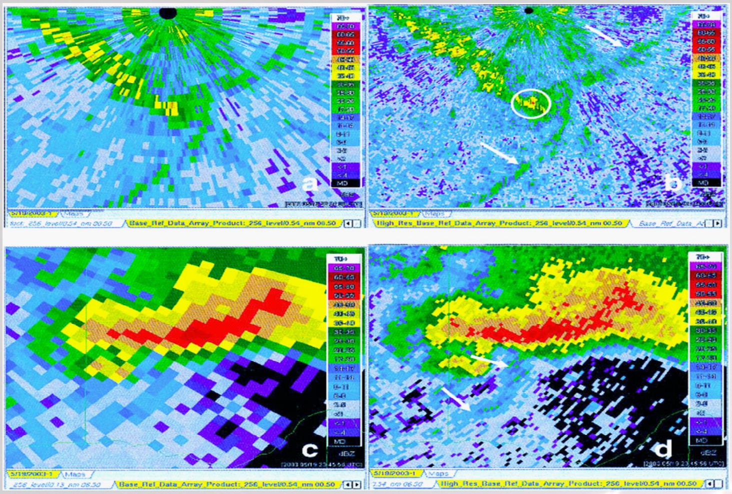
What does super-res mean? It means wind velocity and reflectivity products at or below the 1.5 degree elevation angle are produced at a higher resolution or in finer detail. Super-res reveals the fine details of local storm features such as updraft regions, wind shear and microbursts, tornadic circulations, outflow boundaries, and fronts. This can help meteorologists at NWS Fort Worth better observe signatures of hazardous weather that frequently affect North Texas.

Some examples of the difference between the old doppler radar products (Legacy) and the new super-res images are shown on page 9.

More on Page 9

New Doppler Radar Products Improve Warnings & Forecasts

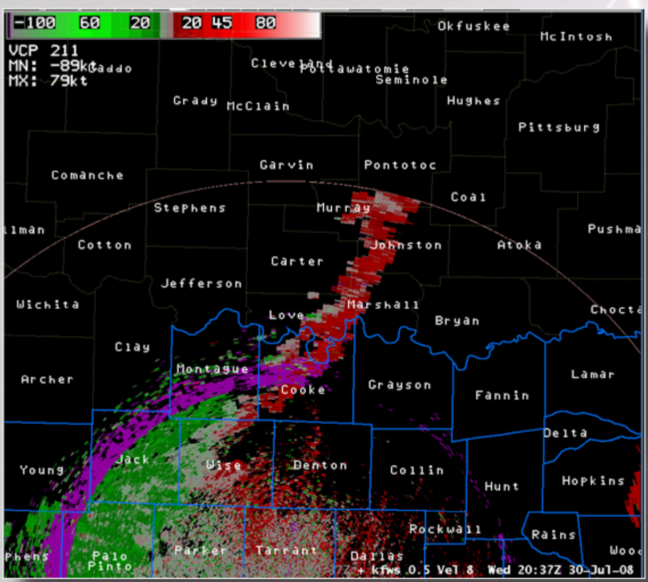
Continued



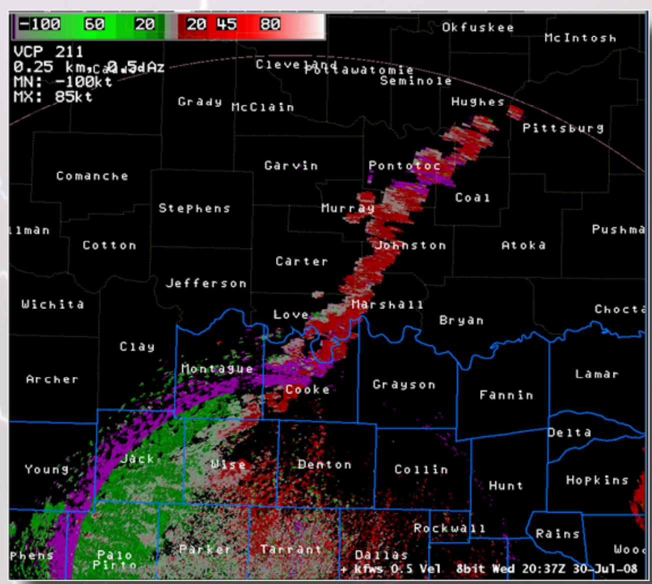
Above: Legacy 8-bit imagery (left) and new Build 10.0 Super-Res imagery (right). Note the improved detail in the Super-Res images.

Another advantage of super-res radar imagery is the range (distance) from the radar antenna that these high resolution reflectivity and velocity products can be viewed. The super-res reflectivity has expanded from 124 nautical miles to 248. The range of velocity products has increased from 124 nautical miles to 162. See the velocity images below.

In addition to the Build 10.0 improvements, the Federal Aviation Administration and the NWS have come to an agreement to share data from Terminal Doppler Weather Radars (TDWRs), which are located at regional airports.



Above: Legacy 8-bit velocity data from KFWS (Fort Worth) radar.



Above: Super-res velocity data from KFWS (Fort Worth) radar.

In the past, TDWR data had been exclusively utilized by the FAA and air traffic controllers for the detection of hazardous weather in and around airports. Since May 2008, NWS Fort Worth forecasters have had TDWR data available to assist with aviation forecasts and provide additional radar coverage near DFW and Dallas Love Field.

The introduction of WSR-88D super-res products and accessibility to the TDWR data will assist NWS Fort Worth meteorologists with future warning and short-term forecast decisions. The improvements to WSR-88D low-level products will pave the way to faster detection of hazardous weather.